

Mobile Unit for Hearing Tests of Kansas Children

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THE NEED FOR hearing conservation programs in the schools of smaller communities and rural areas of Kansas has existed for some time. More than 40 percent of all school-age children in the State have never had a hearing test. These students reside primarily in the rural areas.

Recognizing this need, the division of maternal and child health of the Kansas State Department of Health applied for and was awarded a 5-year project grant from the Public Health Service's Division of Chronic Diseases to demonstrate the importance of early identification and resolution of hearing defects in children through the development of local hearing conservation programs in rural areas of the State.

The basic plan was for the division to conduct screening programs for the schools on request, to provide regional diagnostic otological clinics in cooperation with local physicians, and to do followup studies of the children who were identified as having impaired hearing. After demonstration in an area, the division would work with the local school districts in developing their own hearing conservation programs. This plan was started in the fall of 1964. It is now in its second successful year of operation.

Mobile Unit

In attempting to screen hearing in the rural areas, the examiners were hindered in (a) reaching a relatively small population that was scattered over a large geographic area and (b)

finding an environment quiet enough to obtain valid hearing measurements. The division found that a mobile unit for testing hearing could be moved from school to school with relative ease and at the same time would provide an excellent soundproof environment for testing. Additional benefits would be adequate space to accommodate and transport the testing equipment without damage, storage space for equipment and forms, and suitable working space.

After extensive investigation, the department learned that it was more economical to purchase separately the various components for a testing unit and have them assembled than to buy a preconstructed system. Therefore, a bus chassis (A), commercially built soundproof testing rooms (B), and various other components were purchased and sent to a manufacturing plant (C), where the body of a mobile unit was fabricated and all the components were assembled into a hearing testing unit (fig. 1). The total cost of the unit was approximately \$28,000.

Figure 2 is a floor plan of the mobile unit, which is divided into four areas: a cab for the driver, two soundproof testing rooms, and a central waiting and storage area. One of the two double-walled, soundproof testing rooms is behind the cab; the other is at the rear of the

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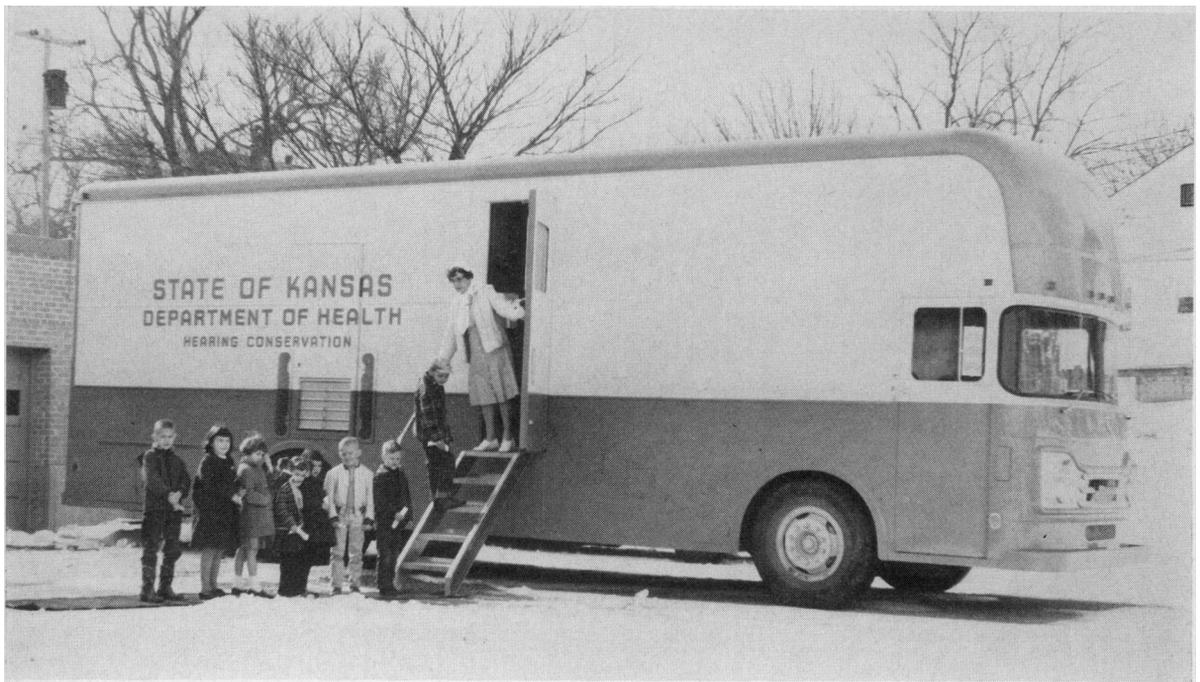


Figure 1. Mobile testing unit

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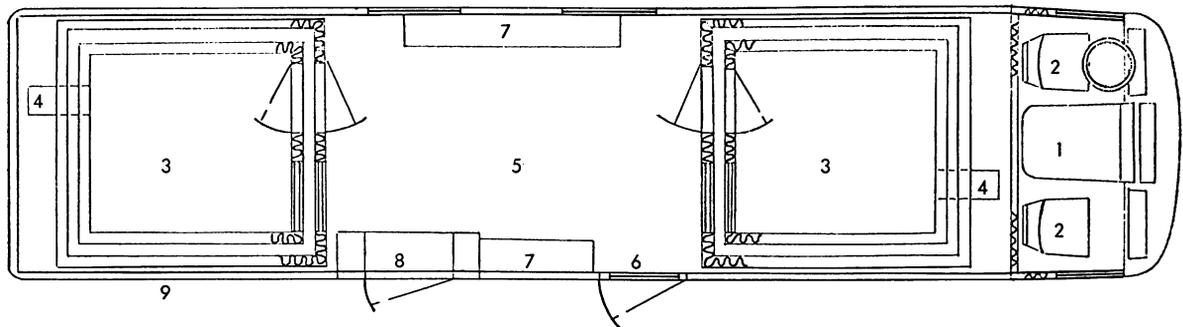


Figure 2. Floor plan of mobile unit: 1, engine housing; 2, driver and passenger seats; 3, soundproof testing rooms; 4, air-exchange units;

5, waiting area; 6, entrance; 7, storage bunkers; 8, heating-cooling equipment; 9, storage of ship-to-shore electrical cable and portable entrance steps.

mobile unit. Both testing rooms have an interior door that opens into the middle or entrance area of the unit. A window in the same wall as each door allows visual communication with the midsection of the unit and the other testing room.

The exterior of the mobile unit is 29 feet long, 8 feet wide, and 13 feet high. The interior dimensions of each of the two testing rooms are 6 feet long, 5 feet 4 inches wide, and 6 feet 2 inches high. The entrance or waiting room is approximately 13 feet long and 7 feet wide.

This room has two windows and a door opening to the curb side of the street. Detachable steps provide access from the curb. The area seats 10 children comfortably and accommodates them until their hearing is tested.

On both side walls of the waiting room are storage cabinets. The bunkers on the floor are used for storing heavy testing equipment when not in use and while being transported. They also serve as seats for the children. The overhead cabinets are used for storing testing forms and lightweight equipment (fig. 3).

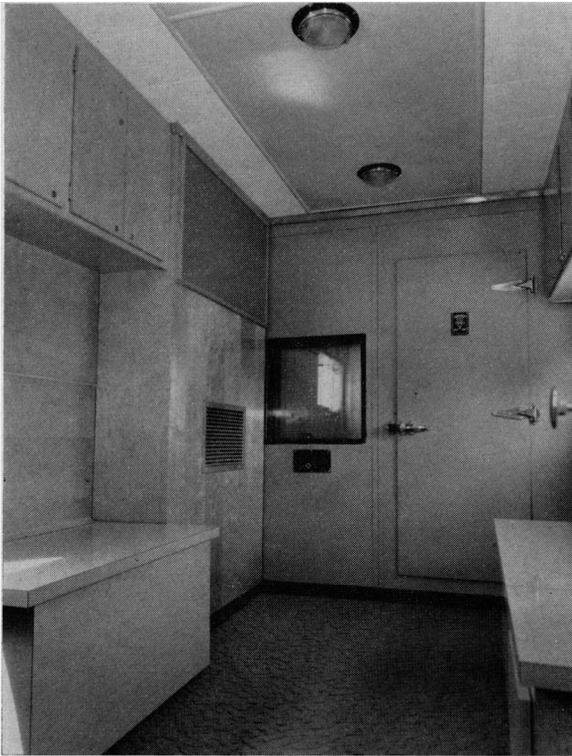


Figure 3. Waiting room and storage area. Rear testing room is beyond window. Storage bunkers and overhead cabinets are on side walls.

On the curb side of the entrance room is thermostatically controlled equipment for the refrigeration, heating, and ventilating system. Conditioned air flows through a duct from this equipment up to and through a false ceiling in the center room. The air continues to flow through the ceiling to the rear of the testing rooms, where special noiseless airblowers exchange and return the air. This system permits comfortable year-round working conditions in the airtight testing rooms.

Electrical power for the heating-cooling system, testing equipment, and other necessary components of the unit normally can be supplied through a 100-foot ship-to-shore cable, which is housed in a storage compartment on the curbside, lower rear section of the unit. However, when a 220-volt, 60-ampere electrical receptacle is not available for use with the cable, all of the unit's electrical equipment can be operated from a 7,500-watt auxiliary generator,

mounted in a compartment in the rear of the unit on the streetside. Controls to start, stop, and regulate all the electrical systems are in the center or entrance room.

The testing equipment includes not only audiometers for screening but also audiometers for pure-tone air and bone conduction threshold tests, speech reception threshold, and speech discrimination tests. These tests quantify hearing loss in the children who do not pass the screening test.

Instruments for calibrating the audiometers (artificial ear, frequency counter, oscilloscope, and voltmeter) are also a part of the unit and are used to check the accuracy of the testing equipment.

Hearing Tests

Normally, the mobile unit can be in operation 15 minutes after arriving at a test site. After initial preparations, 16 to 20 children are brought into the waiting area. Four or five are taken into each testing room, instructed as a group, and then screened individually by the pure-tone test (fig. 4).

Testing several children at one time in these small rooms presents no problem. The examiner is able to instruct more than one child, and the children are given the opportunity to see one of their classmates take the test. Thus the children have a better idea of what to expect when they are tested. While one group is being screened, another group is brought into



Figure 4. Student taking the hearing test in mobile unit.

the waiting area. Children return to their classrooms after testing is completed.

By this method, two audiologists are able to screen more than 500 children in a normal 6-hour school day. If quantitative tests of those children failing the screening test are to be done the day of the screening tests, about 250 children or approximately half the number can be tested, as threshold tests consume much more time than screening tests.

During the 1964-65 school year, 18,600 students were screened. Three diagnostic clinics were held in conjunction with this work. Physician response to the use of the clinics was excellent. Both the mobile unit and the operating procedures of the program have worked satisfactorily.

Summary

More than 40 percent of all school-age children in the State of Kansas, primarily in the rural areas, have never had a hearing test. Recognizing this need, the division of maternal and child health, Kansas State Department of Health, purchased a bus chassis, commercially built soundproof testing rooms, and various

other testing components and contracted with a manufacturing plant to fabricate and assemble the components into a mobile testing unit, to the department's specifications, for use in the State's hearing conservation program for school-age children.

By grouping the children, two audiologists are able to screen more than 500 in a normal 6-hour school day. Only half of this number can be screened if quantitative tests are to be given to those children who fail the screening test.

The department conducts screening programs for the schools on request, provides regional diagnostic otological clinics in cooperation with local physicians, and does followup studies of the children identified as having impaired hearing. After a demonstration program, the division works with the local school districts in developing their own hearing conservation programs.

EQUIPMENT REFERENCES

- (A) Model 1853-FC, International Harvester Co., Chicago.
- (B) Special model No. 1200-A, Industrial Acoustics Co., Inc., New York, N.Y.
- (C) The Gerstenslager Co., Wooster, Ohio.

National Library of Medicine Bibliographies

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7. Erythrocytes in blood preservation. Mid-1963-March 1966. 116 citations.
8. Rubella virus. Mid-1963-March 1966. 71 citations.
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10. Ultrastructure of the kidney. Mid-1963-March 1966. 268 citations.
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